

RECOVERY PLAN

Anastasia Island Beach Mouse and Southeastern Beach Mouse



U.S. Fish and Wildlife Service

RECOVERY PLAN FOR THE
ANASTASIA ISLAND BEACH MOUSE

(Peromyscus polionotus phasma)

and

SOUTHEASTERN BEACH MOUSE

(Peromyscus polionotus niveiventris)

prepared by

U.S. Department of the Interior

Fish and Wildlife Service

Southeast Region

Atlanta, Georgia

Approved: _____



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Regional Director, U.S. Fish and Wildlife Service

Date: September 23, 1993

Disclaimer Page

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EXECUTIVE SUMMARY

Current Status: The Anastasia Island beach mouse is listed as an endangered species, and is restricted to Anastasia Island, St. Johns County, Florida and a recently introduced population at Guana River State Park, Flagler County. The only two healthy populations are confined to the two ends of the island. This subspecies historically occupied about 50 linear miles of beach habitat. Current viable populations are restricted to only about 3 linear miles of beach habitat. The southeastern beach mouse, listed as a threatened species, formerly occurred in beach dunes along about 175 miles of Florida's east coast, from Volusia to Broward Counties. It is now restricted to about 40 miles of coastline, having been extirpated in the southern portion of its historic range.

Habitat requirements and Limiting Factors: Both subspecies occur only in beach dune systems and adjacent interior scrub areas. The greatest threat to these beach mice is the continuing loss or alteration of dunes due to human development and use. The Anastasia Island beach mouse has such a small range that hurricanes and storms are a serious threat to the remaining populations.

Recovery Objectives: Reclassification of the Anastasia Island Beach mouse to threatened, and delisting of the southeastern beach mouse.

Recovery Criteria: The Anastasia Island beach mouse can be considered for reclassification from endangered to threatened status if five viable, self-sustaining populations can be established. Because the majority of this subspecies' historical range has been permanently destroyed, it is not likely that it can be fully recovered and delisted.

The southeastern beach mouse can be considered for delisting if 10 viable, self-sustaining populations can be established throughout a significant portion of its historic range.

Actions Needed:

1. Maintain and restore suitable habitat for each species.
2. Monitor beach mice.
3. Develop reestablishment programs.
4. Initiate captive propagation, if necessary.
5. Educate the public about beach mice.

Total Estimated Cost of Recovery: \$133,000.

FY 94 - \$12,000

FY 95 - \$30,500

FY 96 - \$30,500

FY 97 through FY 2002 - \$10,000 per year

Date of Recovery: 2002.

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I. INTRODUCTION

Taxonomy

The oldfield mouse (*Peromyscus polionotus*) is distributed throughout northeastern Mississippi, Alabama, Georgia, South Carolina, and Florida. Certain subspecies of the oldfield mouse occur on beaches and dunes of the Atlantic coast of Florida and the Gulf coast of Alabama and Florida and are collectively known as "beach mice". These dune-dwelling mice are distinctly paler than inland populations, and have been classified into eight subspecies, based on minor morphological differences. Three Gulf coast subspecies were determined to be endangered species pursuant to the Endangered Species Act of 1973, as amended, on June 6, 1985 (U.S. Fish and Wildlife Service (Service) 1985): the Alabama beach mouse (*Peromyscus polionotus ammobates*), the Perdido Key beach mouse (*P. p. trissyllepsis*), and the Choctawhatchee beach mouse (*P. p. allophrys*). A recovery plan for those three subspecies was approved by the Service on August 12, 1987. Two other subspecies, the Santa Rosa beach mouse (*P. p. leucocephalus*) and the St. Andrews beach mouse (*P. p. peninsularis*), occur on the Gulf coast of Florida and are candidates for Federal listing. The St. Andrews beach mouse is currently listed as endangered by the Florida Game and Fresh Water Fish Commission. The Santa Rosa beach mouse is thought to be more secure but is currently the subject of a Service-funded status survey by the Florida Game and Fresh Water Fish Commission.

The Atlantic coast of Florida originally supported three subspecies of beach mice: the Anastasia Island beach mouse (*P. p. phasma*), the pallid beach mouse (*P. p. discolor*), and the southeastern beach mouse (*P. p. niveiventris*). The Anastasia Island beach mouse was described in 1898 by Bangs as a full species, *Peromyscus phasma*. Osgood (1909) relegated it to subspecific standing under *P. polionotus*. The type locality is Point Romo, Anastasia Island, St. Johns County, Florida. The southeastern beach mouse was described by Chapman (1889) as *Hesperomys niveiventris*. The type locality is Oak Lodge, opposite Micco, Brevard County, Florida. Bangs (1898) subsequently placed it in the genus *Peromyscus*, and Osgood (1909) relegated it to subspecific rank under *P. polionotus*. The pallid beach mouse is believed to be extinct (Ehrhardt 1978; Humphrey and Barbour 1979; Humphrey 1992). The Anastasia Island beach mouse was determined to be an endangered species, and the southeastern beach mouse a threatened species, on May 12, 1989 (U.S. Fish and Wildlife Service 1989). The two subspecies are treated in a single recovery plan because they are closely related, have similar habitat needs, and require similar recovery measures.

Description

The Anastasia Island beach mouse and southeastern beach mouse are large subspecies relative to other forms of the *polionotus* complex. Ten adult Anastasia island beach mice from the type locality averaged 138.5 millimeters (mm) (5.40 inches (in)) in total length and 53 mm (2.07 in) in tail length (Osgood 1909). Howell (unpublished ms, ca. 1940) described the coloration as light ochraceous buff dorsally, white underparts, a unicolor tail, and indistinct white markings on the nose and face. Ten adult southeastern beach mice averaged 139 mm (5.42 in) in total length and 52 mm (2.03 in) in tail length (Osgood 1909). The southeastern beach mouse is slightly darker than the Anastasia Island beach mouse, but paler than inland populations of *P. polionotus*.

Distribution

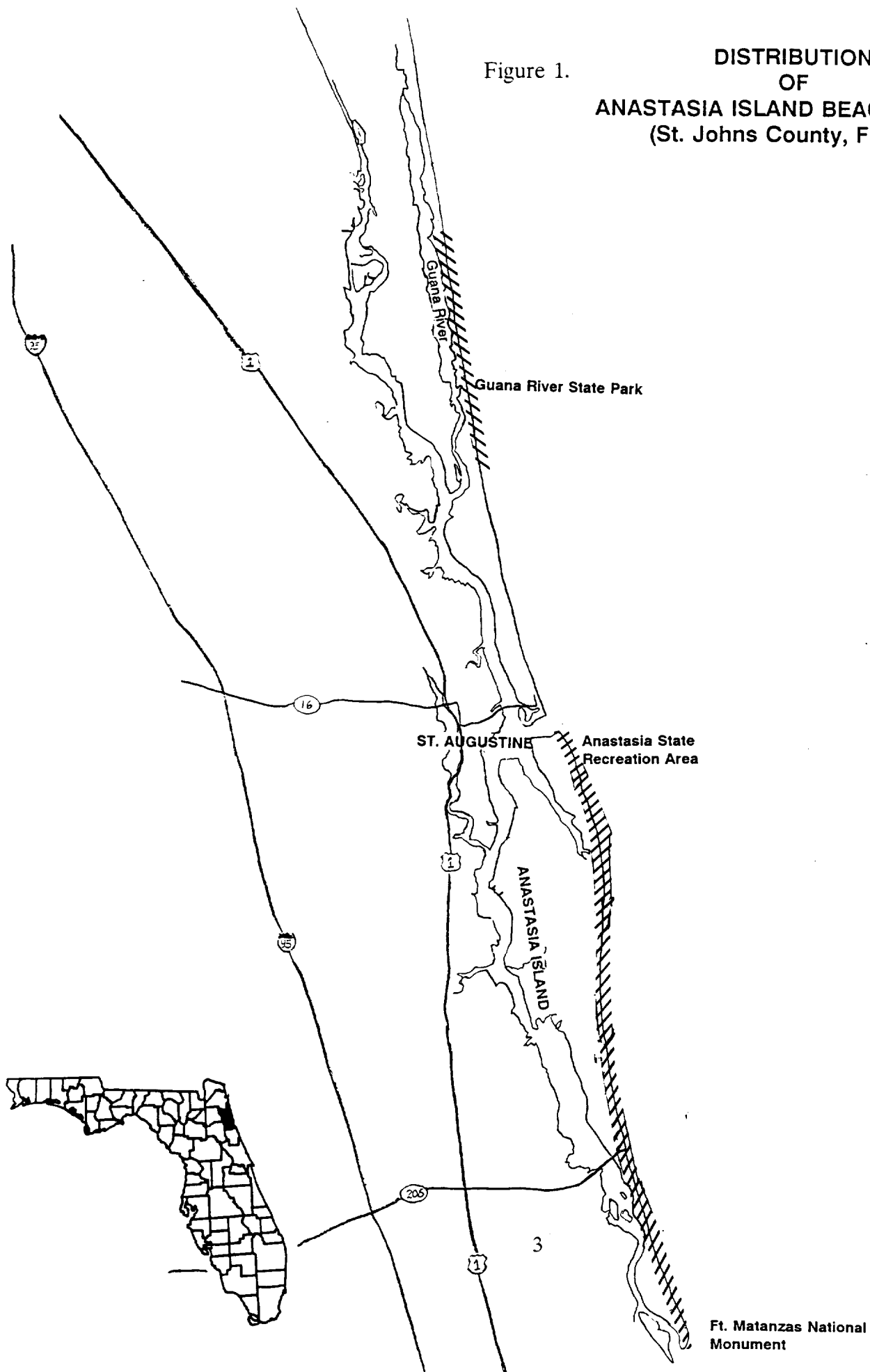
The Anastasia Island beach mouse was known historically from the vicinity of the Duval-St. Johns County line southward to Matanzas Inlet, St. Johns County, Florida (Humphrey and Frank 1992b). It currently occurs only on Anastasia Island, primarily at the north (Anastasia State Recreation Area) and south (Fort Matanzas National Monument) ends of the island, although beach mice still occur at low densities in remnant dunes along the entire length of the island. The original distribution consisted of about 50 linear miles of beach; current populations occupy about 14 linear miles of beach with possibly only 3 miles supporting viable populations (Figure 1). The width of the occupied habitat varies; Frank and Humphrey (1992) described an idealized cross section of dune topography for Anastasia Island which was approximately 150m (495 ft) wide, but most of the dunes on the island are much narrower due to residential construction.

The original distribution of the southeastern beach mouse was from Ponce (Mosquito) Inlet, Volusia County, southward to Hollywood, Broward County, and possibly as far south as Miami Beach in Dade County, Florida (Stout 1992). It is currently restricted to Volusia County (Canaveral National Seashore to 7 miles north of Volusia-Brevard County line), Brevard County (Canaveral National Seashore, Merritt Island National Wildlife Refuge, and Cape Canaveral Air Force Station), and scattered localities in Indian River County (Sebastian Inlet State Recreation Area, Seaview Subdivision, Treasure Shores Park, and Turtle Trail Public Beach Access area) and St. Lucie County (Pepper Park and Fort Pierce Inlet State Recreation Area) (Humphrey *et al.* 1987; Robson 1989; Land Planning Group, Inc. 1991; Humphrey and Frank 1992a). Formerly, this subspecies occurred along about 175 miles of Florida's southeast coast; it now occupies about 50 miles of beach (Figure 2). Although at some sites southeastern beach mice can be found as far as 1 km (0.6 mi) inland (Extine 1980), most available habitat is extremely narrow. The subspecies survives in good numbers in dunes only 1-3 m wide in Indian River County, where it probably also uses adjacent interior coastal strand habitat (Humphrey and Frank 1992a).

Both the Anastasia Island and southeastern beach mice are found in coastal dunes. The most seaward vegetation typically consists of sea oats (*Uniola paniculata*), dune panic grass (*Panicum amarum*), railroad vine (*Ipomaea pes-caprae*), beach morning glory (*Ipomaea stolonifera*), and camphor weed (*Heterotheca subaxillaris*). Further landward, vegetation is more diverse, including beach tea (*Croton punctata*), prickly pear cactus (*Opuntia humifusa*), saw palmetto (*Serenoa repens*), wax myrtle (*Myrica cerifera*), and sea grape (*Coccoloba uvifera*).

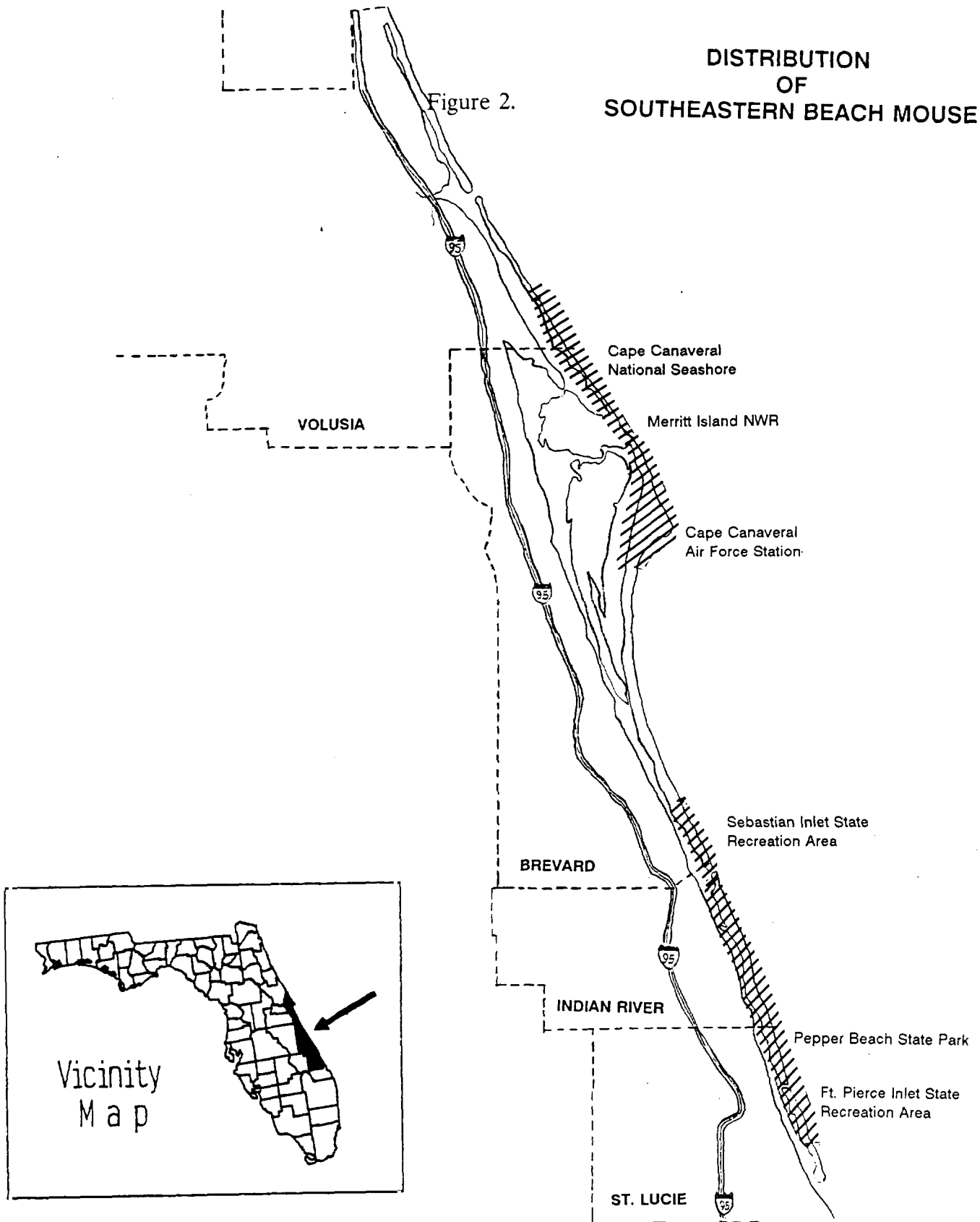
Figure 1.

**DISTRIBUTION
OF
ANASTASIA ISLAND BEACH MOUSE
(St. Johns County, Florida)**



DISTRIBUTION OF SOUTHEASTERN BEACH MOUSE

Figure 2.



Life History

Ivy (1949) trapped Anastasia Island beach mice from sea oats and bare sandy areas on Anastasia Island. He subsequently (1959) reported Anastasia Island beach mice to occur in woody vegetation as far as 152 m (500 ft) inland. Pournelle and Barrington (1953) found this subspecies in woody vegetation as far as 545 m (1800 ft) inland. Extine and Stout (1987) studied movements and dispersion in the southeastern beach mouse on Merritt Island, Brevard County, and found that both beach dunes and adjacent inland areas of scrub vegetation were used by the mice.

Frank and Humphrey (1992) found that the best habitat for the Anastasia island beach mouse is characterized by patches of bare, loose, sandy soil. The presence of sea oats is not a requirement for the mouse; they also occur in sandy areas with broomsedge (*Andropogon* sp.). Adult Anastasia Island beach mice typically weigh from 12 to 18 grams (0.4 to 0.63 ounces), but pregnant females may weigh 20 to 30 grams (0.70 to 1.05 ounces). The young reach maturity at 6 to 8 weeks. Reproduction may occur throughout the year, but peak population levels usually occur in the winter.

Since all subspecies of beach mice are similar in their habitat needs, Blair's (1951) findings on the Santa Rosa beach mouse may generally apply to the Anastasia Island and southeastern beach mice. He found individuals using up to 20 burrows, usually located on the sloping side of a dune, with each consisting of entrance tunnel, nest chamber, and escape tunnel. The nest chamber is at a depth of 0.6 to 0.9 m (2 to 3 ft) while the escape tunnel rises to within 2.5 cm (1 in) of the surface. Beach mice may also use ghost crab (*Ocypode quadrata*) burrows. Beach mice are nocturnal, with most activity occurring on moonlit nights and less activity under stormy conditions or moonless nights. Breeding activity was most evident from November through early January, with large numbers of immature animals present. Young mice moved an average of 432 m (1,415 ft) before establishing a home range. Movement of beach mice is primarily for foraging, breeding, and burrow maintenance.

Rave and Holler (1992) carried out a 3-year study of population dynamics of the Alabama beach mouse (*P. p. ammobates*) at Bon Secour National Wildlife Refuge in Baldwin County, Alabama. Population numbers fluctuated seasonally, with highest numbers in winter and spring. The percentage of subadults was highest in winter and lowest in summer while the percentage of reproductively active females was highest in autumn and lowest in summer. Overall, 63 percent of the mice survived 4 months or less following their first capture, indicating a fast turnover rate in the population, similar to other wild populations of *Peromyscus* which have been studied.

The reproductive potential of beach mice is generally high (Ehrhardt 1978). Captive beach mice are capable of producing 80 or more young in their lifetime, with litters produced as often as 26-day intervals (Bowen 1968).

Food Habits

Beach mice typically feed on seeds of sea oats and dune panic grass (Blair 1951) and also eat small invertebrates (Ehrhardt 1978). Phillip Frank (pers. comm.) found that Anastasia Island beach mice eat seeds of sea oats, railroad vine, and prickly pear cactus. The southeastern beach mouse can be expected to have the same food habits.

Predators and Other Mortality Factors

Predators of the Anastasia Island and southeastern beach mice include snakes, bobcats, foxes, raccoons, skunks, owls, and feral cats and dogs. Feral house cats can reduce beach mouse populations and can be problem at Anastasia State Recreation Area (Phillip Frank, pers. comm.). Predation from house cats and competition from house mice may be restricting the distribution of southeastern beach mice at the north end of Canaveral National Seashore (Seashore). Leased homes are located in this portion of the Seashore, and the area receives nearly 500,000 visitors a year. This places a heavy demand for trash and litter control, and the Seashore has taken measures to reduce the impacts of these human activities on beach mice (Wendell Simpson, Cape Canaveral National Seashore Superintendent, in litt., 1991).

Status of Species

Viable populations of the Anastasia Island beach mouse currently occur at Anastasia State Recreation Area and Fort Matanzas National Monument. The subspecies persists on Anastasia Island at points between these two sites, but due to beachfront development these areas are not likely to support beach mice far into the future. Frank and Humphrey (1992) found Anastasia Island beach mouse numbers to fluctuate seasonally between two to 90 mice per acre, and believed that populations should be characterized by a range rather than a static value.

Large, healthy populations of the southeastern beach mouse are found on the beaches of Canaveral National Seashore, Merritt Island National Wildlife Refuge, and Cape Canaveral Air Force Station (U.S. Air Force 1989). The distribution of this subspecies over the rest of the historical range, however, is more limited in numbers and fragmented.

Conservation Measures Already Taken

The Anastasia Island Beach mouse is protected as an endangered species, and the southeastern beach mouse as a threatened species, under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.)(Act). The Act places an affirmative mandate on Federal agencies to carry out programs for the conservation of federally listed endangered or threatened species. Further, the Act requires all Federal agencies to ensure that their actions are not likely to jeopardize the continued existence of any federally listed endangered or threatened species. Federal agency actions which can directly or indirectly affect endangered and threatened species include any activity that is authorized, funded, or carried out by such agency.

The managers of public beaches within the range of the Anastasia Island and southeastern beach mice currently restrict beach access to designated crossovers (boardwalks) to minimize the impacts of humans on the dune systems. Since public beaches on Florida's east coast receive heavy public use, it is essential that access continue to be so restricted. Vehicular access is allowed on beaches on Anastasia Island, and at high tide vehicles sometimes enter the dunes. Efforts to prevent this type of habitat damage should continue.

Anastasia Island beach mouse:

The National Park Service is working to maintain good beach mouse habitat on Fort Matanzas National Monument and has worked closely with the Service in reviewing management and projects affecting beach mice.

Anastasia State Recreation Area is a heavily used public beach. Management efforts are made there to keep people and vehicles off the dunes, but continual vigilance is necessary. The Division of Recreation and Parks (Florida Department of Environmental Protection) has successfully reduced feral cat populations in the recreation area, and this has benefitted beach mice. Cats may need to be removed periodically.

In 1992 to 1993, the U.S. Fish and Wildlife Service funded the reintroduction of Anastasia Island beach mice to Guana River State Park in St. Johns County, historical habitat for the subspecies (Frank and Humphrey 1993). Guana River State Park is 9 miles north of the existing population of beach mice at Anastasia State Recreation Area.

Fifty-five mice (27 females and 28 males) were trapped at Fort Matanzas National Monument and Anastasia State Recreation Area from September 24, to November 12, 1992, and placed in soft-release enclosures at the state park on September 27, and November 12, 1992.

Follow-up trapping was conducted February 8 to 16, 1993. The entire 6.75 km (4.2 mi.) length of the park was occupied by beach mice; 34 were captured and it was estimated that the population totalled 220. The reintroduction has been successful thus far, despite severe northeasterly storms which caused considerable beach erosion following the releases. The population is still small, however, and it is not yet certain that limited dune habitat at the park will maintain a viable population of beach mice. This effort will continue to be monitored.

Southeastern beach mouse:

The southeastern beach mouse occurs on lands managed by the National Park Service (Canaveral National Seashore), the Fish and Wildlife Service (Merritt Island National Wildlife Refuge), and the U.S. Air Force (Cape Canaveral Air Force Station). Since the listing of this subspecies, several consultations pursuant to Section 7 of the Endangered Species Act have taken place between the Service and other Federal agencies regarding the southeastern beach mouse. Canaveral National Seashore has taken steps to reduce the impact of human use and garbage disposal.

The Anastasia and southeastern beach mice are listed as endangered and threatened species, respectively, by the Florida Game and Fresh Water Fish Commission (Section 39-27, Florida Administrative Code). This listing, in addition to prohibiting take, encourages consideration of these species in management of State lands and State review of development planning.

II. RECOVERY

A. Recovery Objective

The Anastasia Island and southeastern beach mice live in dynamic habitats exposed to recurring tropical storms. Historically, beach mice populations have probably always fluctuated in response to such changes. Due to the current disjunct populations, beach mouse populations are now probably ephemeral over periods of many years. This makes it difficult to define a viable population; the long-term persistence of a given population may depend on the ability of mice from adjacent parts of the range to recolonize beaches. To avoid excessive risks of extinction from demographic, catastrophic, or genetic events, an attempt should be made to establish viable populations containing thousands of mice each. Fluctuations below a few hundred individuals per population is probably an indication that the population is not likely to persist far into the future. Techniques exist for "population viability analysis", which can be used to estimate the probability of survival, for various time periods, of animal populations of differing effective breeding size. While no such analyses have been done for beach mice, available habitat is so limited that it will be difficult to establish many new populations with good prospects for long-term survival.

Anastasia Island beach mouse:

The Anastasia Island beach mouse has lost most of its historical habitat. The northern two-thirds of the historic distribution is now mostly unsuitable for beach mice due to development. Anastasia Island comprises the southern one-third of the historic range of this subspecies, and while beach mice are still found along most of the island's beaches, the only remaining viable populations are believed to be those at the northern (Anastasia State Recreation Area) and southern (Fort Matanzas National Monument) end of the island. Due to the high density of beach homes along most of this coast, it is unlikely that habitat restoration sufficient to support beach mice can be done, and it is unlikely that the species can be fully recovered. The remaining viable populations could be exterminated by a single tropical storm, with much of the habitat destroyed at the same time. Contingency plans should be prepared to take Anastasia Island beach mice into captivity if populations drop to a level at which chances of survival in the wild decrease significantly. If either the Fort Matanzas National Monument or the Anastasia Island State Recreation Area population becomes extirpated, consideration should be given to taking mice from the remaining population into captivity for breeding. The Service's Cooperative Wildlife Research Unit at Auburn University already has experience maintaining breeding colonies of Choctawhatchee, Perdido Key, and Alabama beach mice, and would be an appropriate facility to establish a breeding colony of the Anastasia Island beach mouse.

The recovery goal for this subspecies is to reclassify it as a threatened species. Before this action is considered, the following conditions should be met:

1. The continued viability of the beach mouse populations at the northern and southern ends of Anastasia Island must be assured. Natural population fluctuations must be shown to remain within limits adequate to avoid extinction from chance events or genetic deterioration (e.g., inbreeding depression or excessive loss of heterozygosity). Accordingly, each population of the mouse should support a breeding population of 500 if the subspecies is to be considered for reclassification.
2. At least two more viable populations should be established. These populations should be within the mainland portion of the historic range of the subspecies. However, the only site with any potential for this appears to be the coastal portion of Guana River State Park, managed by the Florida Department of Natural Resources. As discussed, efforts are currently underway to reestablish beach mice at this site. It is uncertain if sufficient dune habitat exists at the site, but the area is basically managed in a manner compatible with the existence of beach mice. Guana River State Park includes a longer beach than those at Anastasia State Recreation Area and Fort Matanzas National Monument, possibly providing greater protection from storm damage.
3. All populations should be monitored for at least 5 consecutive years to assure that condition 1 is met before considering reclassification.

Southeastern beach mouse:

The recovery goal for the southeastern beach mouse is to delist it. Delisting can be considered if the following conditions are met:

1. Viable populations are maintained on the five public land areas where the subspecies currently occurs. Each population should not fluctuate below an effective breeding size of 500 individuals.
2. Five additional viable populations are established throughout the historic range of the subspecies. If acquisition of the Archie Carr National Wildlife Refuge is completed, this area may provide reintroduction sites for one or more populations. The primary purpose of the Refuge is to protect nesting beaches for the loggerhead sea turtle; this goal is compatible with the maintenance of suitable habitat for beach mice.
3. These populations should be monitored for at least 5 years before considering delisting. If delisted, these populations will continued to be periodically monitored as required by the Act.

B. Outline Narrative for Recovery Actions Addressing Threats

1. Protect beach mouse habitat. The ranges of the Anastasia Island and southeastern beach mice are in coastal areas managed and used by humans. Most beaches in the range of the mice have public access, and human use is heavy. Human use of beaches can be compatible with the continued existence of beach mice if such use is managed to avoid damage to the dunes and adjacent habitats used by the mice. Maintaining and improving remaining habitat is essential to the survival of beach mice. Extine and Stout (1987) studied the use of habitat by the southeastern beach mouse, and Frank and Humphrey (1992) have studied habitat use by the Anastasia Island beach mouse. These studies indicate the importance of protecting both beach dune habitat and scrub habitats interior to the dunes.
11. Use provisions of ESA to protect beach mice. Consultations pursuant to Section 7 of the Act are most likely to be required for activities of the U.S. Fish and Wildlife Service, the National Park Service, the U.S. Air Force, the U.S. Army Corps of Engineers, and the Federal Emergency Management Agency. The Service should evaluate private development activities to determine if they will violate the take provisions of Section 9 of the Act. Take incidental to such activities can be permitted only under Section 10(a) of the Act, and requires the development of a habitat conservation plan. Projects related to the missile launch mission of Cape Canaveral Air Force Station will continue to involve land clearing and other impacts that need to be evaluated in terms of impacts on the southeastern beach mouse. Projects which may affect the conservation of beaches occupied by beach mice, such as jetty construction and beach renourishment, require Federal permits and are therefore subject to Section 7 consultation under the Act. Jetty construction could result in the redistribution of sand. Renourishment can result in unnatural compaction of beach sands. Human use of Fort Matanzas National Monument and Canaveral National Seashore needs to be managed in such a way as to minimize human impacts on dunes and adjacent interior habitats.
12. Protect beach mouse habitat on private lands. Landowners should be encouraged to manage their properties in ways compatible with the continued existence of healthy dune habitat and beach mice. The Service should interact with these owners by providing technical advice or entering into cooperative agreements to effect beach mouse conservation.
13. Implement or encourage specific management actions. The habitat needs of beach mice are well enough understood that several management needs can be specified.
 131. Prevent destruction of beach mouse habitat. Roads, parking lots, buildings, and other construction should be set back behind primary dunes and if possible outside beach mouse habitat. Vehicles and foot traffic should be prohibited from dunes. Dune crossovers (boardwalks) should be provided at essential beach access points to avoid dune erosion and blowouts. Beach renourishment projects should avoid

damaging beach mouse habitat. Potential oil spill cleanups, or restoration of beaches following other natural or manmade catastrophes, must also be carried out in a way to minimize adverse effects on the dunes.

132. Prevent establishment of exotic animals and plants. Human visitation and residence in and near beach mouse habitat make it likely that exotic animals associated with man (primarily cats, dogs, black rats and house mice) will become established. These animals are a potential threat to the survival of beach mice through predation or competition. To minimize these risks, the following tasks should be addressed:

1321. Discourage free-ranging cats and dogs. Ordinances, regulations, covenants, deed restrictions and other mechanisms should be used to discourage the introduction and establishment of dogs and cats in beach mouse habitat.

1322. Remove cats and dogs from beach mouse habitat. Land managers should establish a threshold for sightings, sign, or reports of feral animals (especially cats) in beach mouse habitat. When the threshold is exceeded, feral animals should be trapped and removed.

1323. Discourage establishment of exotic rodents. Old world rats and mice are ubiquitous around human development. The establishment and spread of these animals can be discouraged by efficient containment and prompt removal of garbage from residences and recreational areas, and by minimizing the deposit of materials (e.g., construction materials, riprap, or other debris) in beach mouse habitat that might provide shelter for exotic rodents. Rodent traps or poisons that might affect beach mice should not be used in beach mouse habitat.

1324. Discourage establishment of exotic plants. Exotic plants are not currently a threat to the Anastasia Island or southeastern beach mouse, but coastal plant communities occupied by beach mice should be monitored

2. Monitor beach mice. Both subspecies should be monitored to assure that further declines in range and numbers do not occur without recovery actions being taken. Monitoring will also provide information on sites from which to select animals for reintroduction. Both trapping and sign should be used in monitoring these subspecies.

3. Reestablish populations. Recovery of the southeastern beach mouse, and reclassification of the Anastasia Island beach mouse, will require the reestablishment of populations within the historic range of each subspecies.

31. Identify recipient sites. Suitable sites within historic ranges for reintroductions must be secured through agreements with agency or private owners. Restoration or habitat improvement may be necessary to make the sites suitable for reintroducing beach mice.

32. Identify donor populations.
 321. Determine population size and health of potential donor populations. Mice should be removed from populations that can withstand such removal without damage; ideally, donor sites should support several hundred mice. Healthy-appearing stock should be selected.
 322. Obtain stock for translocation. Ages and sex ratios of mice to be translocated, and timing of the translocation, must be selected. Previous translocations of Anastasia Island beach mice have involved trapping mice from donor sites at high population levels during fall and winter and releasing mice at a 1:1 sex ratio.
33. Release mice into new sites. "Soft release" techniques, such as previously used in reintroducing beach mice in the Florida panhandle, should be used. Once mice are reproducing at a release site additional releases may be "hard"; that is, without enclosures.
34. Monitor introduced populations. Periodic monitoring is necessary to determine the success of the introductions. The process may need to be repeated or modified before reintroduction succeeds.
4. Initiate captive propagation. Further declines in the Anastasia Island beach mouse may require that a breeding colony be established to prevent extinction of this subspecies.
 41. Identify donor site for breeding stock. Removal of breeding stock should be done in such a way as to minimize adverse impacts on donor populations and maximize genetic diversity in the breeding stock.
 42. Establish breeding colony. Procedures already developed for maintaining breeding colonies of Gulf Coast beach mice should be followed.
 43. Identify and prepare recipient sites. See task 31 above.
 44. Reintroduce mice. See task 322 above.
 45. Monitor success of new populations. See task 34 above.
5. Educate public. The general public regularly uses beach areas in and adjacent to beach mouse habitat for recreational purposes. Public support for beach mouse recovery should therefore be encouraged. The public should understand that continued existence of beach mice is an indication that healthy beach and dune systems are being maintained. Responsible agencies should produce brochures, signs, and other materials to educate the public about the ecological role of beach mice in beach and dune communities. The public should be informed of recreational practices that are compatible with the continued existence of beach mice.

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III. IMPLEMENTATION SCHEDULE

Priorities in column one of the following implementation schedule are assigned as follows:

1. Priority 1 - An action that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.
2. Priority 2 - An action that must be taken to prevent a significant decline in species population/habitat quality or some other significant negative impact short of extinction.
3. Priority 3 - All other actions necessary to meet the recovery objective.

Key to Acronyms Used in Implementation Schedule

AF	Cape Canaveral Air Force Station
COE	U.S. Army Corps of Engineers
DEP	Division of Recreation and Parks, Florida Department of Environmental Protection
FMA	Federal Emergency Management Agency
TE	Division of Endangered Species, U.S. Fish and Wildlife Service
MI	Merritt Island National Wildlife Refuge, U.S. Fish and Wildlife Service
NPS	Canaveral National Seashore and Fort Matanzas National Monument, National Park Service
REF	Division of Refuges, U.S. Fish and Wildlife Service
RES	Region 8, Division of Research, U.S. Fish and Wildlife Service

RECOVERY PLAN IMPLEMENTATION SCHEDULE

Priority	Task #	Task Description	Task Duration	Responsible Party			Cost Estimates (\$000s)			Comments
				Reg.	Div.	Other	FY94	FY95	FY96	
1	11	Protect beach mice through ESA provisions.	Ongoing	4 4	TE REF	MI NPS AF COE FMA	1	1	1	
1	12	Protect beach mice on private lands.	Ongoing	4	TE	GFC	1	1	1	
1	131	Prevent destruction of beach mouse habitat.	Ongoing	4 4	TE REF	MI DEP NPS AF GFC	0.33 0.33 0.33	0.33 0.33 0.33	0.33 0.33 0.33	Should be little increased cost over existing dune protection programs.
1	41	Identify donor site for breeding stock (AIBM).	1 year	4 8	TE RES	DEP NPS				Involves tasks 41 and 42. See also 43, 44, 45, and 5. Contingency tasks if AIBM population significantly declines.
1	42	Set up breeding colony (AIBM).	Ongoing	4 8	TE RES		2	2	2	
2	132	Prevent establishment of exotic plants, animals.	Ongoing	4 4	TE REF	MI DEP NPS AF GFC	0.1 0.2 0.1 0.1	0.1 0.2 0.1 0.1	0.1 0.2 0.1 0.1	Should be little increased cost over existing dune protection programs.

RECOVERY PLAN IMPLEMENTATION SCHEDULE

Priority	Task #	Task Description	Task Duration	Responsible Party			Cost Estimates (\$000s)			Comments
				Reg.	Div.	Other	FY94	FY95	FY96	
2	2	Monitor populations and range.	Ongoing	4	TE	DEP NPS AF	3 1 1	3 1 1	3 1 1	
3	31	Identify recipient areas.	1 year	4	TE	DEP	0.5			
3	32	Identify donor populations.	1 year	4	TE					
3	33	Release mice into new sites.	1 year	4 8	TE RES			2 8	2 8	
3	34	Monitor introduced populations.		8	RES			2	2	
3	43	Identify and prepare recipient sites.	1 year	4 8	TE RES	DEP NPS		?		For tasks 43 to 45, see comments at task 41.
3	44	Reintroduce mice.	1 year	4 8	TE RES	DEP NPS	2.5 2.5	2.5 2.5		
3	45	Monitor introduced populations.	1 year	4 8	TE RES	DEP NPS	1 1	1 1		
3	5	Educate public.	Ongoing	4	TE	DEP NPS GFC	1	1	1	See comments at task 41.

IV. LIST OF REVIEWERS

Review copies of the Technical/Agency draft of this recovery plan were sent to the following organizations, state agencies, and individuals. Written comments were received from those marked by an asterisk (*).

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